

# ★ S T A R D U S T



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## Hanel to Describe Voyager-2 Uranus I-R Observations



DR. HANEL

Dr. Rudolph A. Hanel, Laboratory for Extraterrestrial Physics, NASA Goddard Space Flight Center, will present new results of infrared Voyager-2 studies of the planet Uranus, in his April National Capital Astronomers lecture. These results in the infrared region complement the studies in the ultraviolet and visual portions of the electromagnetic spectrum which were heard in the March lecture.

Dr. Hanel is a senior scientist at Goddard working on remote sensing for planetary probes and satellites. He has been Principal Investigator for infrared systems experiments on Voyager, Mariner, and several satellite programs, including those of the Tiros and Nimbus series.

Dr. Hanel received his Ph.D. in 1953 from the Technical University in Austria. On a number of his NCA lectures in the past he has discussed the instrumentation involved and the

results of the infrared studies in the encounters of Voyager with Jupiter and Saturn, and of Mariner 9 with Mars.

**APRIL CALENDAR** -- *The public is welcome.*

**Tuesday, April 1, 8, 15, 22, 29, 7:30 pm** -- Telescope-making classes at Chevy Chase Community Center, Connecticut Avenue and McKinley Street, NW. Information: Jerry Schnall, 362-8872.

**Friday, April 4, 11, 18, 25, 7:30 pm** -- Telescope-making classes at American University, McKinley Hall basement. Information: Jerry Schnall, 362-8872.

**Friday, April 4, 18, 8:00 pm** -- NCA 14-inch telescope open nights with Bob Bolster, 6007 Ridgeview Drive, south of Alexandria off Franconia Road between Telegraph Road and Rose Hill Drive. Call Bob at 960-9126.

**Saturday, April 5, 6:00 pm** -- Dinner with the speaker at the Ding How Restaurant, 1221 E Street, NW. Reservations unnecessary.

**Saturday, April 5, 8:15 pm** -- NCA monthly lecture at the U.S. Department of Commerce Auditorium, 14th Street and Constitution Avenue, NW. Dr. Watters will speak.

**Saturday, April 19, 8:00 pm** -- Discussion group: Eyepieces and accessories, with Bob Bolster. Department of Commerce Conference Room 1415. See page 31.

## MARCH LECTURE

Dr. Thomas R. Watters of the Center for Earth and Planetary Studies delivered the 1 March lecture of the National Capital Astronomers monthly series. A research geologist, he discussed the planet Uranus, its rings, and its satellites in the light of early data from the recent Voyager 2 flyby.

Launched in 1977, Voyagers 1 and 2 first were sent to Jupiter, then to Saturn. From there, Voyager 1 was sent far outside the plane of the solar system where it is still measuring solar magnetic fields in regions not previously explored. Voyager 2 was sent on to fly by Uranus on 24 January 1986.

Watters' talk primarily emphasized Uranus' five previously known large icy satellites Oberon, Titania, Umbriel, Miranda, and Ariel, as studied by Voyager's scan-platform instruments: the narrow-angle and wide-angle cameras and the ultraviolet spectrometer.

During the brief encounter many images were taken through narrowband filters of different wavelengths (colors). Composite images of various combinations of these yield false-color images which emphasize and facilitate interpretation of different features otherwise difficult to discern. Pseudo-true colors can also be derived. These techniques combined with ultraviolet spectrometry yielded much information on the planet, its satellites, and its rings.

Image details on Uranus are far more subtle than those of Jupiter or Saturn. What is seen, using the ultraviolet, violet, and orange composite, is a darkening toward the poles, a very few clouds, and some very subtle banding. The origin of the brownish darkening increasing toward the poles seems to be a hydrocarbon haze resulting from reaction of ultraviolet with atmospheric methane.

Atmospheric rotation periods measured at latitudes of 26 and 33 degrees were 16.9 and 16.2 hours -- a difference of 100 meters per second.

The 98-degree inclination of Uranus and its present position in its orbit faces the south pole almost directly toward the Sun. A large thermal gradient from the pole toward the equator, and a resulting strong convection from pole to equator would be expected. If it exists, however, it is neither dominant nor prominent, as evidenced by the latitude-dependent circulation pattern.

Nine rings were known before the mission: From outside, they are designated (rather inconsistently) epsilon, delta, gamma, eta, beta, alpha and 4, 5, and 6. The rings have a very low albedo; they are as dark as charcoal. The albedo of the epsilon ring decreases toward the inner edge. A very dim tenth ring was found just outside the epsilon ring.

An eleventh ring was found, and later images showed many more faint ones reminiscent of Saturn's. Shepherding satellites for the epsilon ring had been predicted and were discovered. Backscattering characteristics indicate that the rings are built of large boulders, in contrast with the tiny ones which make up Saturn's rings.

Including the two predicted shepherding satellites, ten new satellites were discovered, mostly very small, from 150 km to only a few km in width. The smaller ones are quite oblong in shape. One, 1986 U1, displays a very large impact feature.

The five previously known satellites show marked differences. Titania has the highest albedo, in some places as bright as 45 percent. These brightest features are interpreted to be icy ejecta blankets from impact features. Umbriel has the lowest albedo, about 12 percent; its composition may resemble that of the most primitive carbonaceous chondrites.

Oberon shows vague features including some indicating impacts. Some impact craters have dark floors despite the satellite's icy nature. A curious bump of unknown origin is shown. The limited surface activity suggests that the surface is fairly old.

A technique used for estimating the ages of such surfaces is based upon the concept that the impacting flux of meteoritic material reduced in size as the solar system grew. A preponderance of small craters suggests a younger surface.

Umbriel has many craters of widely varying size. The number of very large impact features implies that the surface is very old. Watters conjectured that it is possible that one large impact showered Umbriel's entire surface with the very dark material accounting for the low albedo. The nature of the material must await further data reductions. An interesting feature is a very bright donut-shape in stark contrast with the rest of the surface. It may be found to be an icy impact feature that penetrates a dark coating material. There are other hypotheses; further reductions may hold an answer.

Titania shows many small impact features and few large ones. This implies that its surface is relatively young. There are also *graben*, where tectonic forces have pulled the crust apart and lowered it. This also happens on the Earth and on Mars.

Ariel has a high albedo. There are few large craters, many small ones. This is a very active, relatively young surface. The results of both tectonic and thermal processes are evident.

Miranda is the strangest object yet seen in the solar system. There is one very dark area, and much resurfacing with some very dark material. There are very elaborate chevron-shaped ridge-and-valley areas with a central block. A particularly interesting feature is a 20-km down drop which Watters intends to study in detail. It is unprecedented in the solar system.

Voyager 2 is now on its way to examine Neptune in 1989. At this point President Cavelti suggested marking your calendar for an NCA lecture on 3 November 1989, when the topic will be the Voyager-2 flyby of Neptune!

John B. Lohman

## OCCULTATION EXPEDITIONS PLANNED

Dr. David Dunham is organizing observers for the following occultations. For further information call Dave at 585-0989.

UT	Place	Vis	Pent	Cusp	Min
Date	Time	Mag	Sunlit	Angle	Aper
Grazing Lunar:					
04-01-86	09:40	Havre de Grace, MD	6.8	54	4S 5 cm
04-13-86	00:52	Philadelphia, PA	8.2	12	6N 8 cm
04-15-86	01:49	Centreville, VA	8.3	27	9N 85 cm
04-16-86	03:43	West Chester, PA	7.5	28	9N 5 cm
04-17-86	01:13	Columbia, MD	8.4	46	12N 20cm
Cometary:					
		Star Mag		Comet	
04-07-86	07:49	Acapulco, Mex	8.5	Halley	10 cm
04-25-86	03:00	Queensland, Aus	6.8	Halley*	5 cm

\*During total lunar eclipse

## NCA WELCOMES NEW MEMBERS

Peter J. Brandman  
18356 Timko Lane  
Germantown, MD 20874

Larry E. Cartwright  
6063 Bellview Drive  
Falls Church, VA 22041

George M. Cornecelli  
13157 Lazy Glenn Lane  
Herndon, VA 22071

John Leo; Barbara Singleton  
6200 Wilson Boulevard  
Falls Church, VA 22044

Jim and Laura Nehf  
1111 Independence Avenue  
Washington, DC 20003

Mr. and Mrs. Edward R. Schenker  
19529 Gallatin Court  
Gaithersburn, MD 20879

## DISCUSSION GROUP TO CONSIDER EYEPIECES, ACCESSORIES

The purpose of the NCA discussion groups is to provide a forum for members (and guests) to exchange ideas, ask questions, offer answers, and learn at any level, about selected topics. Join Bob Bolster, who will moderate, and bring either your knowledge or your questions or both for the common benefit. or just listen and learn.

## NCA INVITED TO HOPEWELL CORPORATION OBSERVATORY FOR COMETS

NCA members, families, and their guests are invited to view Comet Halley AT Hopewell Observatory on Sunday, evening, April 27. Arriveal by sunset (7:30 pm EDT) is recommended. Come earlier and bring your prepared picnic lunch if you wish. Coffee, tea, cocoa, and soft drinks will be provided by the Hopewell Corporation.

From the Beltway, go west on I-66 25 miles to the Haymarket exit, left 0.25 mile to traffic light, right on Route 55 0.75 mile to County Road 681, right 3.2 miles to end, left on County Road 601 (gravel) 1.2 miles to County Road 629, right on 629 0.9 mile to narrow paved road on right (Directly across from easier-to-see entrance gate with stone facing on left). Turn right, go 0.3 mile to top of ridge, go around microwave station and continue on dirt road through woods a few hundred feet to site.

Carpooling is recommended. For further information, call Bob Bolster at 960-9126.

## NCA CONTRIBUTES TO STELLAFANE LAND FUND

In Response to an appeal from the Springfield, Vermont Telescope Makers, NCA is contributing \$100 to a fund to purchase land adjacent to the Stellafane observatory site. The land has been used as a parking and camping area for many years, but is now planned for development. The usefulness of this historic site would be severely damaged or destroyed by such development.

Individuals who have attended the annual Stellafane meetings may also wish to make a tax-exempt contribution. Checks should be made payable to Springfield Telescope Makers, and mailed to Doug McGregor, Land Fund Chairman, 4 Russell Avenue, St. Johnsbury, VT 05819.

We thank George Gould for bringing the matter to our attention.

**EXCERPTS FROM THE IAU CIRCULARS**

1. February -- Radio astronomers at the University of Manchester reported the discovery of powerful OH megamaser emission from the compact galaxy III Zwicky 35. The 1667-MHz emission was detected with the Jodrell Bank MK IA radiotelescope during a survey of IR-bright galaxies found by IRAS.

2. February 20 -- Pedersen, Gelly, and West, European Southern Observatory, obtained wide-field CCD images of Comet Halley showing seven tail structures 15' to 110' long. The same structures were imaged again on 23 February, showing changes in length and position angle. Sekanina, University of Californiam, used these and other obsevatons to determine the times and accelerations of seven outbursts which occurred from 11 days before perihelion to 3.2 days after.

3. February 24 -- McCoy, Carruthers, and Meier, Naval Research Laboratory, and Opal, University of Texas, used rocket-borne cameras to obtain far-UV images of Comet Halley. The hydrogen coma was detected to a radius of 5 million km, oxygen to 1.5 million, and carbon to 1 million.

**ASTEROID NAMED FOR NCA MEMBER**

NCA is proud of member Nancy G. Roman, prominent astronomer retired from the National Aeronautics and Space Administration, who has been honored by having asteroid number 2561 named for her.

**WANTED**

January 1986 *Sky and Telescope*. Joseph W. Price, 2110 North Kensington Stret, Arlington, VA 22205. (703) 532-3582.

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★ S T A R D U S T

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